Exp 1
Lexical Analysis

Sai Ram Pendyala
RA1911003010696

AIM:

To write a program to implement a lexical analyser.

ALGORITHM:

1. Start.
2. Get the input program from the file prog.txt.
3. Read the program line by line and check if each word in a line is a keyword, identifier,
constant or an operator.
4. If the word read is an identifier, assign a number to the identifier and make an entry into
the symbol table stored in sybol.txt.
5. For each lexeme read, generate a token as follows:
a. If the lexeme is an identifier, then the token generated is of the form <id, number>
b. If the lexeme is an operator, then the token generated is <op, operator>.
c. If the lexeme is a constant, then the token generated is <const, value>.
d. If the lexeme is a keyword, then the token is the keyword itself.
6. The stream of tokens generated are displayed in the console output.
7. Stop.

PROGRAM:

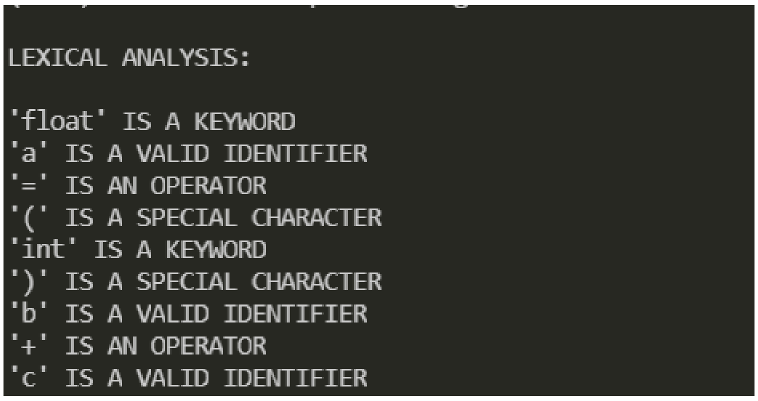
```
      #include <stdbool.h>

#include <stdio.h>
#include <string.h>
#include <stdlib.h>

bool isDelimiter(char ch)
{
    if (ch == ' ' || ch == '+' || ch == '-' || ch == '*' ||
        ch == '/' || ch == ',' || ch == ';' || ch == '>' ||
        ch == '<' || ch == '=' || ch == '(' || ch == ')' ||
        ch == '[' || ch == ']' || ch == '{' || ch == '}')
        return (true);
    return (false);
}

bool isSpecialCharacter(char ch)
{
    if (ch == ',' || ch == ';' || ch == '>' ||
        ch == '<' || ch == '=' || ch == '(' || ch == ')' ||
        ch == '[' || ch == ']' || ch == '{' || ch == '}')
        return (true);
    return (false);
```

```c
}

bool isOperator(char ch)
{
    if (ch == '+' || ch == '-' || ch == '*' ||
        ch == '/' || ch == '>' || ch == '<' ||
        ch == '=')
        return (true);
    return (false);
}


bool validIdentifier(char* str)
{
    if (str[0] == '0' || str[0] == '1' || str[0] == '2' ||
        str[0] == '3' || str[0] == '4' || str[0] == '5' ||
        str[0] == '6' || str[0] == '7' || str[0] == '8' ||
        str[0] == '9' || isDelimiter(str[0]) == true)
        return (false);
    return (true);
}

bool isKeyword(char* str)
{
    if (!strcmp(str, "if") || !strcmp(str, "else") ||
        !strcmp(str, "while") || !strcmp(str, "do") ||
        !strcmp(str, "break") ||
        !strcmp(str, "continue") || !strcmp(str, "int")
        || !strcmp(str, "double") || !strcmp(str, "float")
        || !strcmp(str, "return") || !strcmp(str, "char")
        || !strcmp(str, "case") || !strcmp(str, "char")
        || !strcmp(str, "sizeof") || !strcmp(str, "long")
        || !strcmp(str, "short") || !strcmp(str, "typedef")
        || !strcmp(str, "switch") || !strcmp(str, "unsigned")
        || !strcmp(str, "void") || !strcmp(str, "static")
        || !strcmp(str, "struct") || !strcmp(str, "goto"))
        return (true);
    return (false);
}

bool isInteger(char* str)
{
    int i, len = strlen(str);

    if (len == 0)
        return (false);
    for (i = 0; i < len; i++) {
        if (str[i] != '0' && str[i] != '1' && str[i] != '2'
            && str[i] != '3' && str[i] != '4' && str[i] != '5'
            && str[i] != '6' && str[i] != '7' && str[i] != '8'
            && str[i] != '9' || (str[i] == '-' && i > 0))
            return (false);
    }
    return (true);
}

bool isRealNumber(char* str)
{
    int i, len = strlen(str);
    bool hasDecimal = false;

    if (len == 0)
        return (false);
    for (i = 0; i < len; i++) {
        if (str[i] != '0' && str[i] != '1' && str[i] != '2'
            && str[i] != '3' && str[i] != '4' && str[i] != '5'
            && str[i] != '6' && str[i] != '7' && str[i] != '8'
            && str[i] != '9' && str[i] != '.' ||
            (str[i] == '-' && i > 0))
            return (false);
        if (str[i] == '.')
            hasDecimal = true;
    }
    return (hasDecimal);
}


char* subString(char* str, int left, int right)
{
    int i;
    char* subStr = (char*)malloc(
                sizeof(char) * (right - left + 2));

    for (i = left; i <= right; i++)
        subStr[i - left] = str[i];
    subStr[right - left + 1] = '\0';
    return (subStr);
}


void parse(char* str)
{
    int left = 0, right = 0;
    int len = strlen(str);

    while (right <= len && left <= right) {
        if (isDelimiter(str[right]) == false)
            right++;
        if (isDelimiter(str[right]) == true && left == right) {
            if (isOperator(str[right]) == true)
                printf("'%c' IS AN OPERATOR\n", str[right]);
            else if (isSpecialCharacter(str[right]) == true)
                printf("'%c' IS A SPECIAL CHARACTER\n", str[right]);
            right++;
            left = right;
        }

        else if (isDelimiter(str[right]) == true && left != right
                || (right == len && left != right)) {
            char* subStr = subString(str, left, right - 1);

            if (isKeyword(subStr) == true)
                printf("'%s' IS A KEYWORD\n", subStr);

            else if (isInteger(subStr) == true)
                printf("'%s' IS AN INTEGER\n", subStr);

            else if (isRealNumber(subStr) == true)
                printf("'%s' IS A REAL NUMBER\n", subStr);

            else if (validIdentifier(subStr) == true
                    && isDelimiter(str[right - 1]) == false)
                printf("'%s' IS A VALID IDENTIFIER\n", subStr);

            else if (validIdentifier(subStr) == false
                    && isDelimiter(str[right - 1]) == false)
                printf("'%s' IS NOT A VALID IDENTIFIER\n", subStr);
            left = right;
        }
    }
    return;
}


int main()
{
    char str[100] = "float a = (int)b + c)";
    printf("\nLEXICAL ANALYSIS:\n\n");
    parse(str);
    return (0);
}
```

Result:

Input - “float a = (int)b + c”;

Output –



```
LEXICAL ANALYSIS:

'float' IS A KEYWORD
'a' IS A VALID IDENTIFIER
'=' IS AN OPERATOR
'(' IS A SPECIAL CHARACTER
'int' IS A KEYWORD
')' IS A SPECIAL CHARACTER
'b' IS A VALID IDENTIFIER
'+' IS AN OPERATOR
'c' IS A VALID IDENTIFIER
```